7.2.3.1.3.3 California Brown Pelican

The California brown pelican was listed as an endangered species under the ESA in 1970 and by the Commission in 1971 because of decreased population numbers and extensive reproductive failures. These resulted from the effects of DDT and other chlorinated hydrocarbons in the late 1960s. Additionally, they are a fully protected species under FGC §3511. California brown pelicans are found in estuarine, marine subtidal, and pelagic waters along the California coast. They breed in the Southern California Bight (SCB) at West Anacapa and Santa Barbara islands, and at several islands off Baja California, Mexico. During the non-breeding season, these birds disperse along the coast as far north as Vancouver, British Columbia and south to El Salvador. California brown pelicans are colonial nesters and require nesting grounds free from human disturbance and mammalian predators, and in proximity to adequate food supplies (Gress and Anderson 1983). Nest sites are located on steep, rocky slopes and bluff edges and are comprised of sticks or debris. Communal roost sites are essential habitat for California brown pelicans (Gress and Anderson 1983) because, unlike other seabirds, California brown pelicans have wettable plumage (Rijke 1970) which can become heavy and hypothermic in cold water if they do not come ashore regularly to dry and recondition their plumage. Roost site selection is based on minimal disturbances and microclimate features that aid in thermoregulation. California brown pelicans congregate in traditional high quality roosts at night with major night roosts supporting hundreds to thousands of pelicans (Briggs et al. 1987). Substantial numbers (averaging in the thousands) roost on South Farallon Island and feed in the surrounding waters during the fall and winter.

California brown pelicans are diving birds that feed almost exclusively on fish and dive from distances of 6 to12 meters (~19 - 40 feet) in the air (Johnsgard 1993). The main prey items in California are northern anchovies, Pacific sardines, and Pacific mackerel. After the collapse of the sardine fishery in the 1950s, northern anchovies were found to comprise 92 percent of the diet of California brown pelicans nesting in the SCB (Gress et al. 1980, Gress and Anderson 1983). In recent years however, the Pacific sardine population has been increasing and may now be common items in the California brown pelican diet.

The California brown pelican may be affected by nearshore fishing activities (e.g., vessel proximity, motor noise, generators, lights, radios, gunshots, whistles, etc.) near known rookeries and roosting sites. The recovery plan for the California brown pelican (U.S. Fish and Wildlife Service 1983) describes the negative effects of disturbance. Although they are large seabirds, California brown pelicans are nonetheless disturbed by events which are out of the ordinary (Anderson and Keith 1980, Anderson 1988). This includes not only direct human disturbance, but loud noises as well. This conclusion is bolstered by additional work on disturbance effects upon wintering brown pelicans (Jaques and Anderson 1988). They found that not only are pelicans sensitive to subtle

movements by researchers, they are also cautious about choosing a roosting site and even appear to rely on other species such as gulls for sentinels. In 1999, California brown pelican productivity declined noticeably on Anacapa Island (Gress, pers. comm.). It is hypothesized by USFWS that this decline was attributed to the presence of vessels fishing for market squid and the associated bright lights and noise near the rookeries during the breeding season, which could have caused undue stress and resulted in nest abandonment.

7.2.3.1.3.4 Terns, Skimmers, and Gulls

Terns are related to gulls but are generally smaller, more pelagic, and can undertake long migrations. The California least tern is both state and federally listed as endangered and is a fully protected species under FGC §3511. California least terns are small migratory colonial nesting seabirds that arrive at breeding sites in southern California around April and depart in August. Nesting starts in mid-May. Breeding colonies are located along marine and estuarine shores from San Francisco Bay to San Diego County. Wintering areas are unknown but are suspected to be along the coast of South America (Massey 1977). California least terns feed on small fish in shallow nearshore waters or in shallow estuaries or lagoons; most feeding takes place in the early morning and late afternoon. As with other terns, California least terns hover in the air then dive for fish near the surface. California least terns nest on the ground on open sand or gravel. Clutch size is usually two to three eggs, and a single brood is raised yearly (Rigney and Granholm 1990). Both parents incubate the eggs which hatch in 20 to 25 days. The semiprecocial (semi-independent) young are tended by both parents, are mobile at 3 days, and can fly by 28 days (Rigney and Granholm 1990). Active management is necessary at nesting sites to deter predators and human disturbance.

Elegant terns are both a federal and Department SSC. Elegant terns are migratory colonial nesting seabirds that arrive at a few breeding sites along the southern California coast in June and depart by October (Beedy 1990). The number of nesting colonies has increased along the coast, most likely due to colony protection and use of artificial nesting sites (Carter et al. 2001a). The preferred habitats are inshore coastal waters, bays, estuaries, and harbors, but never inland (Beedy 1990). After the breeding season, birds may disperse along the entire California coast but most migrate south as far as South America. Elegant terns feed on fish by diving into shallow nearshore waters as well as estuaries, bays, and lagoons.

Black terns are considered an SSC by the Department. Colonies formally occur at interior lakes in California. Black terns are restricted to freshwater habitats while breeding, but can be found at bays, salt ponds, river mouths, and pelagic waters during spring and fall migration (Beedy 1990) when they may forage in the nearshore zone. Numbers have declined due to loss of foraging and nesting sites as well as pesticide pollution (Beedy 1990).

Black skimmers are considered a SSC by the Department. The black skimmer is a migratory colonial nesting seabird that arrives at breeding sites along the California coast in Orange and San Diego counties (and inland at the Salton Sea) by late April and departs by October, although some birds are resident year-round (Beedy 1990). The number of nesting colonies has increased along the coast, most likely due to colony protection and use of artificial nesting sites (Carter et al. 2001a). Black skimmers feed on small fish and crustaceans in calm, shallow waters by flying along the water's surface with their lower mandible cutting the surface (Cogswell 1977). Nesting takes place on the ground, on open sand or gravel, often near other nesting seabirds such as gulls and terns. Clutch size is usually four to five eggs and a single brood is raised yearly. The semiprecocial young are fed by both parents and are dependent upon their parents until a month after they are ready to fly (Erwin 1977). Preferred nesting habitats are beaches and sand bars, which makes them vulnerable to human disturbance.

California gulls are considered an SSC by the Department. California gulls nest primarily inland (on islands in lakes) although they do nest in San Francisco Bay (Carter et al. 2001a) and visit the coast in the nonbreeding season (late summer to March). Along the coast, California gulls prefer sandy beaches, mudflats, rocky intertidal, and pelagic areas of marine and estuarine habitats, and wetlands (Rigney 1990). California gulls are omnivorous and feed on garbage, carrion, fish, earthworms, insects, and brine shrimp (Rigney 1990). The breeding population in California has declined due to human-related habitat changes at interior colonies and associated introductions of predators (Rigney 1990, Carter et al. 1992)

The western gull breeds along the Pacific coast from British Columbia to central Baja California (Carter et al. 1992). The largest breeding numbers (estimated at about 61,800 birds) occur in California. The Farallon Islands in central California harbor the largest colony in the world, and large numbers are also found in the Channel Islands (Carter et al. 1992). Western gulls do not disperse far from their breeding range in the winter. They are omnivorous and feed on garbage, fish, cephalopods (including market squid), euphausiids, offal, and birds and eggs (including adult and chicks of auklets and petrels, gull chicks, and eggs). Off the Farallon Islands, breeding birds are known to primarily feed in surface waters on live prey (Ainley et al. 1990). Western gull numbers have increased in the past few decades, likely due to the use of human garbage disposal sites, fishing offal and bait for food, and the elimination of direct human intrusion into the breeding colonies on the South Farallons Islands with their designation as a National Wildlife Refuge in 1969 (Carter et al. 2001a). As a result, increased predation on rare birds, such as ashy storm-petrels on the Farallon Islands where western gull numbers have reached saturation, could become a threat to small populations (Nur et al. 1999).

Several other species of gulls visit and feed along the California coastline during their non-breeding seasons. The Heermann's gull, which nests in the Gulf of California and Baja California, is a common visitor to California, from the Mexican border to Monterey Bay, in the summer and fall (Carter et al. 1992). Other gulls include Bonaparte's, mew, ring-billed, herring, Thayer's, glaucous-winged, Sabine's, and black-legged kittiwake. Gulls are not capable of deep dives, thus they are surface feeders and many may include squid species in their diets. Market squid is known to be consumed by wintering California, mew, glaucous-wing, and Heermann's gulls and black-legged kittiwakes (Baltz and Morejohn 1977, Morejohn et al. 1978). Market squid and northern anchovy were the most important prey items for glaucous-wing and Heermann's gulls in Monterey Bay (Baltz and Morejohn 1977).

Behavior patterns of gulls may be influenced by fishery activities. They are attracted to fishery operations where they feed on bait or on scavenged or discarded targeted species or bycatch. For example, gulls, which are normally diurnal, are known to forage at night near squid fishing boats where they are attracted by the activity and bright lights. Artificial lighting may also increase lighting and foraging abilities of gulls on colonies, resulting in increased levels of predation on nocturnally nesting seabirds. In 1999, western gulls were noted by researchers as more active at night when squid lights were on in the Channel Islands (Channel Island National Park, unpublished data). Gulls and terns also may be affected by ancillary marine fishing activities (e.g., vessel proximity, motor noise, generators, lights, radios, gunshots, whistles, etc.) near rookeries and roosting sites.

7.2.3.1.3.5 Alcids

Alcids are pelagic seabirds that are the northern hemisphere's ecological counterpart to the southern hemisphere's penguins. Marbled murrelets are listed as federally threatened and state endangered due to small population numbers and loss of old-growth forests as nesting habitat. They breed along the coasts of the north Pacific Ocean from Japan, across the Aleutians, and south to central California (Harrison 1983). In California, they occur year-round in marine subtidal and pelagic habitats from the Oregon border to Point Sal, Santa Barbara County, although during the nesting season they are concentrated closer to breeding areas (Sanders 1990). Marbled murrelets are the only California alcid to breed inland where they use dense stands of coastal coniferous forest for nesting and roosting. The estimated 1,600 breeding individuals nest in the northern California counties of Del Norte and Humboldt (about 42% of the population) and in the central California counties of San Mateo and Santa Cruz (about 44%) (Carter et al. 1992). In the breeding season, marbled murrelets forage close to shore in shallow waters less than 500 meters from shore (1,640 feet), usually less than 30 meters (95 feet) deep, while in the non-breeding season they often forage farther from shore (Sealy 1972). Marbled murrelets feed by diving and pursuing small fish. They are monogamous, solitary nesters

that lay one egg between mid-May and mid-June. The young fledge from early July through early September. Marbled murrelets are threatened with habitat loss from logging and vulnerable to contamination from oil spills along the coast.

Xantus's murrelets are considered an SSC by the Department and are a globally rare seabird species (one of the ten rarest seabird species in the North Pacific). There is an effort for a state listing, due to its small population size and limited breeding range, as well as declining world population size (estimated as less than 10,000 birds) and known threats to colonies. Xantus's murrelets are small birds that feed on larval fish including northern anchovies, sardines, rockfish, Pacific sauries, and crustaceans, and forage in the immediate vicinity of the colony during the nesting season (Hunt et al. 1979). The world population of Xantus's murrelet only breeds from the Channel Islands south to Central Baja California. Eighty percent of the United States breeding population and 33.5 percent of the world's breeding population nest in the Channel Islands, primarily at Santa Barbara Island (also found at San Miguel, Santa Cruz, and Anacapa islands). They return to the nesting islands in February and disperse from the islands by mid-July. They nest in rock crevices along steep cliff edges, under bushes, on the ground in vegetation, in burrows, under debris piles, and under human made structures. Daylight hours are spent on nests or foraging at sea, whereas nest site selection, incubation shift changes, and fledging all occur under cover of night (Hunt et al. 1979). Chicks depart to the sea with their parents at night at two days of age and are dependent on their parents for an extended period of time (Gaston and Jones 1998). Chicks that get lost or separated from their parents at night, or those who leave the nest during the day, are often fed upon by predators (e.g., western gulls).

Population numbers of Xantus's murrelets have been declining for the past 20 years. Because they spend a substantial amount of time in the water, Xantus's murrelets are vulnerable to oil spills, contamination by marine pollution, and entanglement in fishing gear (Carter et al. 2000). Predators include peregrine falcons, western gulls, barn owls, deer mice, and introduced predators such as feral cats and black rats. No direct studies on sensitivity to humans have been conducted on Xantus's murrelets. However, their nesting abundance and distribution can be correlated with human activities (Keitt 2000), and human impacts and disturbance are considered one impediment to population increases in Baja California. Human-generated noise and disturbances are another cumulative impact for these specialized birds that evolved on island or offshore rock environments, far from human disturbance. Murrelets are known to be attracted to bright light sources, particularly on dark, foggy nights (Whitworth et al. 1997, Carter et al. 1999). Effects are described at the end of the alcid section. Disorientation from lights can cause parent-chick separation (which will result in increased mortality of young-of-the-year) and has been observed in the Channel Islands (Keitt, Kelly, Naughton, and McChesney, pers. comm.).

Rhinoceros auklets are considered an SSC by the Department due to small population numbers in the state. Rhinoceros auklets feed on small fish, crustaceans, and cephalopods (including market squid) by diving and pursuing their prey underwater (Cogswell 1977). A study on the winter diet of Rhinoceros auklets in Monterey Bay found market squid to be the predominant prey item (Baltz and Morejohn 1977). Rhinoceros auklets are colonial, monogamous nesters that breed along the coasts of the north Pacific Ocean (Harrison 1983). In California, approximately 1,800 birds nest in burrows and crevices on offshore islands from the Oregon border south to San Miguel Island (Carter et al. 1992). The largest colonies are located on offshore rocks in Del Norte County and on the Farallon Islands in central California. Rhinoceros auklets are nocturnal at nesting colonies and mostly enter and leave the burrow at night, a mechanism thought to reduce predation. They lay one egg which is incubated by both parents for one month. The semiprecocial young remain in their burrow for 35 to 45 days, then leave for the sea before reaching adult size (Harrison 1978). Rhinoceros auklets are sensitive to human disturbance and are vulnerable to oil spills. Because of their nocturnal habits at nesting colonies, rhinoceros auklets are accustomed to flying in total darkness and may become disoriented in bright lights. Effects are described at the end of the alcid section.

Tufted puffins are considered an SSC by the Department. While colonies are found along the coasts of the north Pacific Ocean, only a small number, estimated at 276 birds, breeds in California (Carter et al. 1992). They nest on offshore islands in northern California, at the Farallon Islands and Point Reyes in central California, and have recently recolonized southern California at the Channel Islands, where they had not been seen since the early 1900s (Carter et al. 2001a). Tufted puffins feed on medium-sized fish, crustaceans, and squid by diving and pursuing their prey underwater (Cogswell 1977). Diet studies in the Gulf of the Farallones found market squid to be a predominant prey item, along with anchovies and rockfish (Ainley et al. 1990). Tufted puffins are colonial nesters who burrow on island cliffs or grassy island slopes and may visit the nest burrow in daylight hours. Tufted puffins lay one egg which is incubated for about 45 days. The semiprecocial young is tended by both parents and remains in the burrow for close to two months. Fledglings depart for the sea alone, at night (Gaston and Jones 1998), and may become attracted and disoriented by lights and collide with vessels, increasing the normal mortality rates of young-of-the-year.

The common murre is a large alcid which breeds in both the north Pacific and north Atlantic oceans. In California, they are year-round residents off the coast of northern and central California, with small numbers observed in southern California. (Cogswell 1977). They are diurnal feeders that prey on fish by pursuing them underwater. Prey items include cephalopods (including squid), crustaceans, and a variety of small fish (e.g., juvenile rockfish, sand lance, pacific herring, sardines, and anchovies) (Baltz and Morejohn 1977, Morejohn et al 1978, Ainley et al. 1990). Diet studies in the Gulf of the Farallones point to

market squid as a principal prey item (Ainley et al. 1990). Common murres are colonial, monogamous nesters who nest on cliff ledges of rocky islands and seacoasts and on the flat tops of low rocky islands from the Oregon border to central Monterey County. The largest colonies are found on offshore rocks in Del Norte and Humboldt counties and at the Farallon Islands in San Francisco County. Eggs are laid on the bare ground or rock from late April to late June. The eggs hatch from late May to mid-July, and the young fledge from mid-June to mid-August (Sowls et al. 1980). The altricial young remains at the nest for one month, then jumps to the ocean below. Thereafter, the half-grown, flightless chick is accompanied and fed at sea by the male parent for about two months (Gaston and Jones 1998).

central California common murre numbers declined an estimated 52.6% between 1980 and 1986 due to mortality in gill nets and oil spills and low breeding success during a severe El Niño-Southern Oscillation event (Takekawa et al. 1990, Carter et al. 2001b). Population numbers have increased in the 1990's but are still substantially lower than historical levels (Carter et al. 2001b). Oil spills and entanglement in fishing gear are still threats to the viability of local colonies. Human disturbance, such as by aircraft and boats, can also impact nesting success at colonies depending on proximity to colony, timing, frequency, and duration of disturbances (Thayer et al. 1999, Parker et al. 2000, 2001, Rojek and Parker 2000). Common murres have been targeted by Trustee Agencies [California Department of Parks and Recreation (DPR), California State Lands Commission, DFG, National Oceanic and Atmospheric Administration (NOAA), and U.S. Fish and Wildlife Service (USFWS)] for restoration actions in recent oil spill damage assessments because of the tenuous status of the central California population and the fact that they are the most common victims of oil spills in California. Much of the millions of dollars in natural resource damages collected by Oil Spill and Prevention Response (OSPR) in the past few years have been based on injuries to, and compensatory restoration for, common murres (Page and Carter 1987, Page et al. 1990).

Cassin’s auklets are found along the Pacific coast, breeding from the Aleutian Islands in Alaska to central Baja California (Carter et al. 1992). They nest in rock crevices and burrows on offshore rocks and islands in northern California, at the Farallon Islands in central California, and at the Channel Islands in southern California. The largest breeding colony is found at the South Farallon islands (Carter et al. 1992). There numbers are in decline at the Channel Islands and the Farallons and are being considered for inclusion on the SSC list. They feed largely on crustaceans (primarily euphausiids) but also consume fish and squid (Ainley et al. 1990). Cassin’s auklets are nocturnal in their colony visits, and chicks fledge the colony at night. Because of these behaviors, they may become disoriented in bright lights near breeding colonies, with effects as described at the end of the alcid section.

Alcids may be affected by ancillary fishing activities (e.g., presence of vessels, motor noise, generators, lights, radios, gunshots, whistles, etc.) near rookeries and roosting sites. Nesting sites can be disturbed by boats, low-flying aircraft, and intruding humans (Reimer and Brown 1997; Parker et al. 2000, 2001; Rojek and Parker 2000). When adults are disturbed they may knock eggs and chicks off nesting ledges, or leave them vulnerable to predation from western gulls and ravens. It has been documented that the small vessels used in the nearshore live trap fishery are disturbing nesting colonies of common murres at Hurricane/Castle Rock, Monterey County, and Point Reyes, Marin County (Parker et al. 2000, 2001; Rojek and Parker 2000). Documentation and data have shown that continued and increasing boat disturbance often results in the loss of chicks and eggs. While this documentation is limited to four colonies that are being actively monitored, there is no reason to believe that similar disturbance patterns do not exist at other colonies.

As mentioned in the species descriptions above, artificial night-lighting can be a problem for several alcid species which are nocturnal in colony or foraging habits. When flying in total darkness, alcids may become disoriented by and attracted to bright artificial lights (Verheijen 1958, Reed et al. 1985, Telfer et al. 1987). This may cause birds to crash into lighted boats, which can result in direct mortality or birds falling stunned and/or injured into the water or landing on deck (Dick and Donaldson 1978). Injured birds become easy targets for predation after daylight. In worst cases, the adult birds may avoid the colony and not return to their nests, as nocturnal seabird species are known to reduce levels of colony attendance during lighted or full moonlight conditions, likely to avoid predation (Manuwal 1974; Watanuki 1980; Story and Grimmer 1986; Keitt, in review). In addition, for several species, fledglings depart the colony at night. They may become attracted and disoriented by lights and collide with vessels, increasing the normal mortality rates of young-of-the year. This has been documented for fledging petrels and storm-petrels in Hawaii and is a major concern for the survival of these species (Byrd et al. 1978, Reed et al. 1985, Reed 1987, Telfer et al. 1987, Harrison 1990).

The concern over the potential impacts of artificial lights on seabirds in the Channel Islands arose in 1999 when large increases in artificial light intensity levels associated with nighttime squid fishery boat activity extended into the seabird breeding season. The use of bright lights (current regulation of 30,000 watts maximum per vessel) is thought to increase the mortality of Xantus's murrelets, and likely other alcid species, nesting in the Channel Islands. In 1999, increased mortality rates of Xantus's murrelets due to predation by barn owls were recorded (Channel Islands National Park, unpublished data). Additionally, western gulls, predators of Xantus's murrelet which are normally diurnal, were noted by researchers as more active at night when squid lights were on, and predation rates likely increased over normal levels (Channel Island National Park, unpublished data).

7.2.3.1.3.6 Storm-petrels

Storm-petrels are small, highly pelagic seabirds that prey on small invertebrates (young squid, euphausiids, crab larvae) and small fish while they flutter along at the ocean's surface. They only come to land for nesting, otherwise they remain over the open sea. Four species breed in California on offshore islands nesting in burrows or rock crevices (Carter et al. 1992). Storm-petrels are monogamous, lay a single egg, and both parents participate in raising the nidicolous (nest reared) young. The adults are nocturnal in their nesting colony activities, which are thought to reduce predation by gulls that are normally diurnal (Ainley et al. 1974, Watanuki 1980, Storey and Grimmer 1986). Parents may only return with food to the young every few nights; thus, foraging trips may last several days. Since they come and go by night, they are rarely seen by man or other potential predators. The chicks are abandoned by the parents about a week before they have fully fledged. The young birds leave the nests to feed at sea once their flight feathers are completed developed.

Three species of storm-petrels, ashy, black, and fork-tailed, are considered SSCs by the Department, and the ashy is a globally rare seabird species (one of the ten rarest seabird species in the North Pacific). Ashy storm-petrels are restricted to the north-east Pacific Ocean, breeding on islands from central to southern California (with a few small colonies in Baja California and northern California). Approximately half of the world's population, estimated at less than 10,000 individuals, nest at the Farallon Islands, and half at the Channel Islands, primarily at San Miguel, Santa Barbara, and Santa Cruz islands (Carter et al. 1992). The breeding period is from April through November, although birds may visit their nesting colonies year-round. Dispersal in the non-breeding season is thought to be limited. Large numbers congregate each fall in Monterey Bay. Populations of ashy storm-petrels have declined by an estimated 34% over the past 20 years at the Farallon Islands (Sydeman et al. 1998a, 1998b) (long-term trends are not available for the Channel Islands population). Factors in their decline include habitat loss from invasive non-native plants; introduction of feral cats, house mice, and other non-native animals; decline in zooplankton in the SCB; and predation by house mice, western gulls, burrowing owls, and other owl species (Sydeman et al. 1998, Nur et al. 1999). Ashy storm-petrels are also known to be sensitive to human disturbance, oil pollution, and marine pollution.

Black storm-petrels are found in the northeast Pacific Ocean. They primarily breed on islands off the coast of Baja California and in the Gulf of California (Harrison 1983). A small population, estimated at 274 individuals, breeds from April to October on Santa Barbara Island in Santa Barbara County (Carter et al. 1992). After breeding, birds generally move south towards northern South America, however, in warm-water years large numbers move as far north as Monterey and Point Reyes (Harrison 1983).

Fork-tailed storm-petrels are widely distributed in the northern Pacific Ocean, breeding on islands from the sea of Okhotsk, Russia, across the Aleutian Islands, and south to northern California (Harrison 1983). In California, the estimated breeding population of 410 birds breeds on six small islets off Del Norte and Humboldt counties from March to September (Carter et al. 1992). Individuals are observed as far south as southern California in the non-breeding season.

Storm-petrels are not likely to become entangled in fishing gear because of their feeding methods. However, they may be affected by ancillary fishing activities (e.g., vessel proximity, motor noise, generators, lights, radios, etc.) near roosting and breeding sites. Because of their nocturnal colony habits, storm-petrels are accustomed to flying in total darkness and may become disoriented by, and attracted to bright artificial lights (Verheijen 1958, Reed et al. 1985, Telfer et al. 1987). This may cause birds to crash into lighted boats, which can result in direct mortality or result in birds either falling stunned and/or injured into the water or landing on deck (Dick and Donaldson 1978). Injured birds become easy targets for predation after daylight. In worst cases, the adult birds may avoid the colony and not return to their nests, as nocturnal seabird species are known to reduce levels of colony attendance during lighted or full moonlight conditions, likely to avoid predation (Manuwal 1974; Watanuki 1980; Story and Grimmer 1986; Keitt, in review). In addition, storm-petrel fledglings depart the colony on their own at night. They may become attracted and disoriented by lights and collide with vessels, increasing the normal mortality rates of young-of-the-year. This is documented for fledging petrels and storm-petrels in Hawaii and is a major concern for survival of these species (Byrd et al 1978, Reed et al. 1985, Reed 1987, Telfer et al. 1987, Harrison 1990).

Storm-petrels (and related petrels and shearwaters) are known to be attracted to and strike lighted longlining vessels, as well as other lighted vessels, fishing at night in the southern hemisphere (Reid pers. comm., Weimerskirch et al. 2000), lighted vessels at night in Alaska (Canez, Trapp, and Williams pers. comm.) and Newfoundland (Chardine pers. comm.), and artificial night-lighting in Hawaii (Reed et al. 1985, Telfer 1987). There are documented interactions of inflight strikes of storm-petrels with lighted fishing vessels and other lighted vessels in the Channel Islands (McChesney, Naughton, and Yaremko pers. comm.). The concern over the potential impacts of artificial lights on seabirds in the Channel Islands arose in 1999 when large increases in artificial light intensity levels associated with night-time squid fishery boat activity extended into the seabird breeding season. The use of bright lights (current regulation of 30,000 watts maximum per vessel) is thought to increase the mortality of ashy storm-petrels and equally likely the black storm-petrel nesting in the Channel Islands. In 1999, western gulls, which are normally diurnal and a predator of storm-petrels, were noted by researchers as more active at night when squid lights were on, and predation rates likely increased over normal levels (Channel Island National Park, unpublished data).

7.2.3.1.3.7 Cormorants

Double-crested cormorants, Brandt's cormorant, and pelagic cormorants are yearlong residents along the entire coastline of California. All three species feed mainly on mid-water to bottom-dwelling fish, diving from the surface to pursue prey underwater. Brandt's cormorants are known to forage on market squid (Baltz and Morejohn 1977, Morejohn et al. 1978, Ainley et al. 1990). They forage principally in nearshore waters less than 50 meters in depth and at short distances from nesting or roosting sites (Ainley et al. 1981, Hebshi 1998). Coastal cormorant species nest on rocky headlands and on offshore islands from the northern border of California to Santa Barbara County and on the Channel Islands. The breeding season can start as early as January for pelagic cormorants and is completed by September for all three species. Cormorants are monogamous colonial nesters with clutch sizes ranging from two to seven eggs. Incubation is performed by both parents and the young are altricial (dependent on adult care). Predators on eggs and young include crows, ravens, and western gulls. Roosting sites on offshore rocks, islands, cliffs, wharfs, and jetties are important habitat for all cormorants year-round because, unlike other seabirds, their feathers are not completely waterproof and they need to dry them daily (Johnsgard 1993).

The double-crested cormorant is considered an SSC by the Department. This species is found over most of North America, with an estimated breeding population of 10,000 individuals in California (Carter et al. 1995). The subspecies found along the California coast breeds mainly in marine and estuarine habitats, with some nesting inland (Harrison 1983). Population declines occurred throughout the 1900s and continue in some colonies due to habitat loss, marine pollution, human disturbance, and introduced predators (Carter et al. 1995). In the Channel Islands, breeding numbers of double-crested cormorants, as well as Brandt's cormorants, have declined since 1991, probably due mostly to the El Niños in 1992-93 and 1997-98 (McChesney et al. 2000a).

Cormorants can be affected by ancillary fishing activities (e.g., vessel proximity, motor noise, generators, lights, radios, gunshots, whistles, etc.) near rookeries and roosting sites. It has been documented that the small vessels used in the nearshore live trap fishery are disturbing nesting Brandt's cormorants at the Hurricane/Castle Rock, Monterey County, and the Point Reyes, Marin County, colonies (Parker et al. 2000, 2001; Rojek and Parker 2000). Human disturbance of breeding colonies is known to cause nest abandonment and increased predation of eggs and young by gulls (Ellison and Cleary 1978, Manuwal 1978). Similarly, continual disturbance of roosting sites could compromise the cormorant's abilities to waterproof its feathers and effect thermoregulation.

7.2.3.1.3.8 Loons

The common loon is considered an SSC by the Department due to former breeding in California. This large, foot-propelled diving bird nests in the northern United States and Canada but is highly migratory (Cogswell 1977). They are fairly common transients in marine subtidal and nearshore habitats along the coast of California during their wintering season, approximately September through May (Harrison 1983, Granholm 1990). The loon primarily consumes fish and crustaceans while in the wintering grounds and can dives as deep as 61 meters (193 feet) (Palmer 1962).

Other loons that are found along the California coast in the winter include Arctic, red-throated and Pacific loons. The Arctic loon is documented to consume market squid in Monterey Bay (Baltz and Morejohn 1977, Morejohn et al. 1978).

7.2.3.1.3.9 Albatrosses, Fulmars, and Shearwaters

Albatrosses are large, highly pelagic seabirds than can fly thousands of miles from their breeding colonies. No albatrosses breed in the continental United States, but several species, the most common being the black-footed, visit the California coast during the non-breeding season. The black-footed albatross nests in the subtropics, primarily in the northwestern Hawaiian Islands, in the winter months (Harrison 1983). Young birds can be found throughout the Pacific year-round. Albatrosses feed on prey on the ocean surface or just below it, and also scavenge. Squid, myctophids, and other invertebrates and fish are their primary prey items (NMFS 2001). Albatross are also known to be attracted to debris behind fishing vessels (NFMS 2001).

The northern fulmar is found in the North Pacific and Atlantic Oceans, breeding at higher latitudes (Alaska in the United States). Non-breeding birds are found along the California coast, feeding primarily along the surface but they are also known to scavenge (Baltz and Morejohn 1977). Prey items include squid, zooplankton, fish, and other invertebrates. Fulmars are thought to do most of their feeding at night, which enables them to obtain prey items (squid, myctophids, and crustaceans) that come to the surface at night (Hatch and Nettleship 1998). In Monterey Bay, fulmars were found to consume primarily market squid and other cephalopods (Baltz and Morejohn 1977, Morejohn et al. 1978).

Shearwaters are highly migratory seabirds that form dense feeding rafts on the sea. Several species visit the California coastline in their non-breeding season. Sooty, pink-footed, Buller's, and Short-tailed shearwaters breed in the southern hemisphere and can be found in California between March and November (Harrison 1983). Black-vented shearwaters breed on islands off Baja California and disperse north as far as Monterey Bay (and in warm water years even further north) from June through January (Harrison 1983). Sooty shearwaters are our most numerous shearwater and their numbers in the Gulf of the Farallones (primarily from May through July) can exceed one million birds (Briggs et al.

1987). All of these shearwater species feed on the surface or by plunge diving up to 10 meters in depth and include squid in their diets. Diet studies of sooty shearwaters conducted in early summer in central California have revealed squid as an important component of the diet, along with anchovies, juvenile rockfish, and euphausiids (Ainley et al. 1990). Winter diet studies in Monterey Bay indicate market squid is an important prey item for sooty, short-tailed and pink-footed shearwaters (Baltz and Morejohn 1977, Morejohn et al. 1978). Other squid species were also consumed.

7.2.3.1.3.10 Bald Eagle

The bald eagle is federally (although petitioned for delisting) and state listed as endangered, and is a fully protected species under FGC §3511. Bald eagles are found seasonally along the coast and offshore islands of California. They require large bodies of water and adjacent snags or other perches so they can swoop from hunting perches or soaring flight to pluck fish from the water (Polite and Pratt 1990). Bald eagles scavenge dead fish, water birds, mammals, and possible squid found at the water surface. Bald eagles also pursue live fish, but do not dive underwater nor rest on the water (as seabirds do); thus, interactions with squid fishermen are possible but not likely.

Formally a resident breeding species on all of the Channel Islands, the bald eagle disappeared from the islands by the early 1960s (Kiff 1998). More than 30 eagles have been released and breeding has been reestablished at Santa Catalina Island, Los Angeles County, and some live on the mainland in Santa Barbara County. A recovery plan for the bald eagle is currently in place that establishes geographical goals for population enhancement.

As part of the Montrose Settlements Restoration Program (the Department is a representative of this Trustee Council), about 12 juvenile bald eagles will be released on Santa Cruz Island in the summer of 2002. This is part of a feasibility study to determine if the program will attempt to reintroduce bald eagles to the northern Channel Islands (Montrose Settlements Restoration Program, 2001). There is no information available to determine if bald eagles would be impacted by the squid fishery in the northern Channel Islands, however, squid fishing does occur off Santa Catalina Island and bald eagle breeding has been reestablished there. It is possible that artificially lighting from squid vessels could enable bald eagles, which are normally a diurnal feeder, to forage at night and possibly prey on seabird species. To ensure successful reintroduction of bald eagles to the northern Channel Islands, the Council should monitor potential release sites and the availability of prey for eagles prior to release. If the Council believes that eagles may be impacted by the market squid fishery or may result in impacts to other listed or sensitive species, they should coordinate activities with the Department to identify appropriate areas for release that will minimize impacts.

7.2.3.1.3.11 Plovers

The Pacific coast population of the Western snowy plover (*Charadrius alexandrinus nivosus*) is federally listed as threatened and is a California Species of Special Concern. A draft recovery plan is currently being written by the U.S. Fish and Wildlife Service (2001). This small shorebird breeds above the mean high tide line on coastal beaches, dunes, estuaries, and lagoons from Washington to Baja, California (USFWS 2001). The U.S. Pacific Coast population is estimated at 2,000 or less individuals. The nesting season extends from March through September. Plovers lay between 2 and 6 eggs, which are incubated for about 24 days. The precocial young fledge between 29 and 47 days of age.

In winter, western snowy plovers range from southern Washington to central America in coastal areas, although some breeding groups in California remain on their breeding grounds year-round. Snowy plovers primarily fed on terrestrial and marine invertebrates.

Population declines have been attributed to habitat degradation, human disturbance, and predator expansion (including gulls, ravens, coyotes, foxes, and skunks) into nesting areas (Powell 2002). Declines have been particularly apparent in southern California and the Channel Islands National Park Service has documented declines in breeding numbers in the Channel Islands since 1991 (Martin and Sydeman 1998). Breeding has not occurred on San Miguel Island since 1999, and numbers have been declining at Santa Rosa Island (only 23 birds in 2001) (Paige Martin, personal communication). The park service prohibits access to the nesting area on the east side of Santa Rosa Island during the breeding season, from 1 March to 15 September. No studies have been conducted to determine if the bright lights and noise associated with the squid fishery has a negative impact on the breeding activity of western snowy plovers in the Channel Islands and along the coast in central and southern California. Increased light levels can alter the behavior of diurnal species and result in nest abandonment (Avery 2000, Bower 2000). Additionally, diurnal predators, such as western gulls, have been noted by researchers as more active at night when squid lights are on (Channel Island National Park, unpublished data). Thus, predation rates of plover adults, eggs, and/or chicks by diurnal predators could be increased over normal levels. Therefore, it is possible that the fishery could have impacts to nesting plovers if fishing occurs close to breeding colonies during the breeding season.

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7.2.3.1.3.12 Environmental Consequences of Proposed Actions on Marine and Coastal Birds

7.2.3.1.3.12.1 “No Project or Status Quo” (Current Regulations)

Market squid are eaten by a number of marine birds. Their importance in the diet varies among species. Although there is information about which prey species are consumed by seabirds, it is not possible to estimate the total amount of

market squid consumed by seabirds in California waters. Thus, it is not possible to determine the allocation of market squid necessary to sustain seabird populations and, consequently, this makes analysis difficult of whether market squid fishery management practices are having a potentially significant impact on seabirds. However, it should be noted that the goal of squid fishery management is to maintain a long-term economically viable fishery that matches the level of effort to the health of the resource. Current regulations include a two-day, weekend closure and a seasonal statewide limit on catch, which are precautionary management measures. In the absence of conclusive biological information upon which to base a quota or other management approach, a two-day per week time period allows for uninterrupted spawning in areas where squid are present. Unlike a seasonal quota or seasonal closure, this measure spreads the escapement throughout the year, rather than concentrating it at the beginning or end. Current interim management measures also include a seasonal statewide catch limitation (landings cap) which limits landings to a maximum seasonal catch, a research and monitoring program which assists in management of the squid fishery to achieve sustainability, and monitoring of the squid harvest through an egg escapement model at 30%.

There are no reports of mortality or serious injury in marine birds species from the gear used in the squid purse seine fishery in California waters. Several surface-feeding and scavenging species (gulls, albatrosses, fulmars, and shearwaters) are attracted to fishery operations to feed on bait or discarded targeted species and bycatch, resulting in mortality or serious injury to the birds. In addition, these species consume squid, which could be an additional attraction to such vessels. Thus, we cannot rule out the possibility that the squid purse seine fishery may interact with these species. Currently, the fishery is not monitored at sea so mortality of these species, if occurring, has not been reported.

There are documented interactions of inflight strikes of ashy storm-petrels and Xantus's murrelets with lighted fishing vessels and other lighted vessels, particularly on dark, foggy nights, in the Channel Islands (Whitworth et al. 1997, Carter et al. 1999, McChesney and Naughton, personal communications). Artificial night-lighting can be a problem for several seabird species that are nocturnal in colony or foraging habits. Breeding seabirds in California that are susceptible to inflight strikes include Xantus's murrelet, Cassin's auklet, rhinoceros auklet, all of the storm-petrel species (ashy, black, fork-tailed, and Leach's), and the fledgling chicks of tufted puffins. When flying in total darkness, seabirds may become disoriented by and attracted to bright artificial lights (Verheijen 1958, Reed et al. 1985, Telfer et al. 1987). This may cause birds to crash into lighted boats, which can result in direct mortality or result in birds either falling stunned and/or injured into the water or landing on deck (Dick and Donaldson 1978). Injured birds become easy targets for predation after daylight. Storm-petrels (and related petrels and shearwaters) are known to be attracted to and strike lighted longlining vessels, as well as other lighted vessels, fishing at

night in the southern hemisphere (Reid, pers. comm., Weimerskirch et al. 2000), lighted vessels at night in Alaska (Canez, Trapp, and Williams, pers. comm.) and Newfoundland (Chardine, pers. comm.), and artificial night-lighting in Hawaii (Reed et al. 1985, Telfer 1987).

In addition, fledglings of the species listed above depart the colony only at night. They also may become attracted and disoriented by lights and collide with vessels, increasing the normal mortality rates of young-of-the-year, as is documented for fledging petrels and storm-petrels in Hawaii and is a major concern for survival of these species (Byrd et al 1978, Reed et al. 1985, Reed 1987, Telfer et al. 1987, Harrison 1990). Disorientation from lights can cause parent-chick separation of Xantus's murrelets and has been observed in the Channel Islands (Keitt, Kelly, Naughton, and McChesney, pers. comm.).

Close to breeding colonies, artificial lighting may result in adult birds avoiding the colony and not returning to their nests to attend their eggs and chicks. Studies have shown that nocturnal seabird species display highly reduced activity levels on moonlit nights when they are apparently more susceptible to predation (Manuwal 1974; Watanuki 1980; Story and Grimmer 1986; Keitt, in review). Even on a moonless night, lighted vessels are capable of increasing light levels at a colony up to moonlight levels. Physics calculations show that one unshielded vessel burning 30,000 watts needs to be about a mile away from a colony to bring the light levels down to moonlight levels and even further to emit levels below moonlight (Dr. Fajans pers. comm.). Brad Keitt (Island Conservation and Ecology Group, unpublished data) measured light levels on Middle Anacapa from market squid light boats on 2 April 2000 at full moonlight levels at an estimated distance of one kilometer. From his studies of black-vented shearwaters in Mexico (which are also nocturnal and preyed on by western gulls), he concluded that increased predation of nocturnal birds in the Channel Islands likely occurs with artificial lighting (Keitt pers. comm.). Successive nights of high artificial light levels, in combination with the lunar cycle, close to breeding colonies could disrupt the normal nesting activities of these birds, resulting in increased predation, nest abandonment, or increased mortality of eggs and chicks

The concern over the potential impacts of artificial lights on seabirds in the Channel Islands arose in 1999 when large increases in artificial light intensity levels associated with night-time squid fishery boat activity extended throughout the seabird breeding season. The use of bright lights is thought to increase the mortality of Xantus's murrelets and ashy storm-petrels (and equally likely the black storm-petrel, rhinoceros auklet, and Cassin's auklet) nesting in the Channel Islands. In 1999, increased mortality rates of Xantus's murrelets due to predation by barn owls were recorded (Channel Islands National Park, unpublished data). Additionally, western gulls, which are normally diurnal, and a predator of murrelets and storm-petrels, were noted by researchers as more active at night

when squid lights were on, and predation rates likely increased over normal levels (Channel Islands National Park, unpublished data).

During the 1999 season, higher than average rates of nest abandonment and chick mortality, which could not be explained by other environmental factors, were recorded for California brown pelicans (Gress, unpublished data). Brown pelicans and other seabirds are affected by ancillary fishing activities (e.g., vessel proximity, motor noise, generators, lights, radios, etc.) near roosting and breeding sites. Research has shown that many seabird species are disturbed by events which are out of the ordinary (Manuwal 1978; Anderson and Keith 1980; Carney and Sydeman 1999). This includes not only direct human disturbance, but also loud noises. Disturbances at brown pelican and double-crested cormorant colonies are known to cause nest abandonment and increased egg predation (Ellison and Cleary 1978; Anderson 1988). Increased light levels are known to alter the behavior of diurnal species (e.g., brown Pelicans, cormorants, gulls) leading to nest abandonment, and as a result increased egg and chick mortality (Avery 2000; Bower 2000).

Following the 1999 season, the Department and federal agencies, concerned about the brown pelican population recovery and population levels of the Xantus's murrelet and ashy storm-petrel in the Channel Islands, were interested in avoiding any potential new interactions with these birds. To avoid risks to nesting brown pelicans and interactions with other seabird species of concern, the Commission has implemented a maximum allowable light wattage and specific requirements for orientation and shielding of lights for vessels fishing or lighting for squid. The management measures specify: (1) to reduce wattage from any individual vessel to 30,000 kilowatts, and (2) to require the use of shielding for all vessels commercially fishing or landing squid. These interim regulations went into effect 30 May 2000.

Research has not been conducted to measure the effects of the shielded lights and reduced wattage regulations on seabird rookeries and enforcement is difficult. While these regulations reduce the illumination intensity of each vessel, they do not avoid all impacts to sensitive species, as reduced wattage and shielding still produces light above ambient levels. At this time, there is no control over the number of squid vessels in any particular area. Since illumination levels are additive, multiple boats close to colonies will cumulatively illuminate islands above normal levels. Personnel from the Channel Islands National Park Service have reported squid boats fishing as close as 75 to 450 feet (< 1/8 mile) from Anacapa Island, and as many as 12 boats at one time. Furthermore, noise associated with squid fishing activities (e.g., engine noise, generators, radios, human voices, gunshots) still has the potential to cause disturbances to breeding seabirds.

In addition, the shielded lights and reduced wattage regulations do not avoid interactions with nocturnally active species. We cannot rule out the possibility

that artificial night lighting associated with the squid purse seine fishery will result in disorientation of these species and collisions with vessels. Small amounts of light on vessels in the Channel Islands have been observed to cause disorientation in Xantus's murrelets and their chicks.

The Channel Islands provide important breeding habitat for listed (California brown pelican snowy plover, and bald eagle), SSC (Xantus's murrelet, ashy storm-petrel, black storm-petrel, rhinoceros auklet, tufted puffin, and double-crested cormorant), and globally rare seabird species (Xantus's murrelet and ashy storm-petrel).

Anacapa and Santa Barbara Islands are the only United States breeding sites for the California brown pelican, a federal and state endangered species. The islands also provide nesting habitat for 80% of the U.S. population and 33.5% of the world's population of breeding Xantus's murrelet (currently petitioned for state and federal listing), and 50% of the U.S. population and 41% of the world's population of breeding ashy storm-petrel. The only other major nesting site for the ashy storm-petrel, the Farallon Islands, is in decline. The only black storm-petrel colony in the United States is found on Santa Barbara Island. Impacts to the Channel Island populations of these species can have serious, long-term consequences for the survival of these species.

The American Trader Trustee Council, of which the Department is a representative, oversees the compensation for natural resources losses attributable to the American Trader oil spill. Part of their restoration plan will restore seabird nesting habitat for burrow/crevice and ground nesting nocturnal seabirds on Anacapa Island by eradicating the introduced black rat. These efforts at conservation could be negatively countered by lost reproduction as a result of disturbance by large levels of artificial illumination from nearby vessels. Other threats to these species, which all cumulatively contribute to their declining numbers, include: human disturbance in the colony (i.e., entering sea caves), exotic predators, pollution (egg-shell thinning due to DDE still occurs in the Channel Islands), oil spills, and alterations in food availability. Given what we know about the effects of artificial night lighting and human disturbance of colonies for these seabird species, as well as for related species around the world, artificial night lighting associated with the squid purse seine fishery could significantly impact recovery of these species, especially during the breeding season.

7.2.3.1.3.13 Significance Criteria for Marine and Coastal Birds for the Proposed Management Options

Seabirds can be affected by a wide variety of factors including human disturbance, changes in key prey species, oil spills, toxic contaminants, fishery interactions, predation, and changes in climatic conditions. Unfortunately, there

are many informational voids concerning seabird ecology, especially winter ecology, which makes it difficult to determine if a particular fishery is having a negative effect on a seabird population. Population monitoring has been conducted for some species that nest on cliffs and flat ground (e.g., California brown pelican, cormorants, common murres, California least tern) and for crevice dwelling species (e.g., Xantus's murrelets, storm-petrels, auklets, pigeon guillemots), but the data are not complete or uniform for all seabird breeding colonies throughout the state. Information concerning fishery interactions is, for the most part, anecdotal and difficult to quantify. Food habit data and the relationship to changes in key prey species are not well known, nor are the effects of environmental changes. This lack of information makes an analysis of whether fishery management practices are having a potentially significant impact on seabirds difficult.

The effect of fishery management decisions on seabird populations is typically considered in the context of direct and indirect effects. Direct effects are those where a seabird is incidentally seriously injured or killed as a result of activities associated with the fishery. This would include serious injury or death resulting from bycatch or entanglement in fishing gear, serious injury or death resulting from seabirds in flight striking a fishing vessel, and disturbances that significantly impair essential behavioral patterns including breeding, feeding, or sheltering. Indirect effects are those that may be caused by the fishery, but are later in time or farther removed in distance, yet are reasonably foreseeable and causally related. This includes the reduction of seabird prey abundance and availability.

Based on best professional judgment derived from existing scientific data, environmental impacts associated with a proposed alternative are considered significant when:

- The danger of irreparable injury to or mortality in any population of any species of seabird which is occurring at a rate that threatens the viability of the population as a result of the proposed changes to the operation of the fishery.
- The impairment of the recovery of a seabird species listed as an endangered species or threatened species pursuant to the federal Endangered Species Act (16 U.S.C. § 1531 et seq.) or the California Endangered Species Act (Fish & G. Code § 2050 et seq.), or a species of seabird designated as fully protected under the Fish and Game Code (Fish & G. Code § 3511 et seq.) would occur as a result of the proposed changes to the operation of the fishery.
- There is the potential, as a result of the proposed changes to the operation of the fishery, to reduce the number or restrict the range of an 'endangered, rare, or threatened' seabird species as defined in section 15380 of Title 14 of the California Code of Regulations.
- The proposed changes to the operation of the fishery may result in significant environmental impacts on seabirds that are individually limited,

but cumulatively considerable. That is, the incremental effects of the proposed project on seabirds are considerable, and therefore significant, when viewed in connection with the similar effects of past, present, and probable future projects.

7.2.3.1.3.14 Alternatives (Management Measures)
There is an assortment of management measures that can be used to achieve the goals of the market squid FMP (MSFMP). These include limited entry, catch limitations, time and area closures, harvest replenishment areas, commercial gear restrictions, permit fees, monitoring programs, vessel identification, bycatch, prohibited species and size, and coordination with the Federal CPSFMP. The impact of each Alternative on marine birds is discussed below.

7.2.3.1.3.14.1 Limited Entry Alternative
Limited entry for harvesting vessels and light boats would reduce the number of currently permitted vessels but there is still the potential for remaining vessels to interact with several surface-feeding and scavenging seabird species (gulls, albatrosses, fulmars, and shearwaters) which may be attracted to the vessels to feed on squid. Thus, we cannot rule out the possibility that the squid purse seine fishery may interact with these species. Currently, the fishery does not have observers so interactions with these species have not been reported. However, the reduction in the number of vessels should result in less interactions than exist in the current fishery (status quo).

7.2.3.1.3.14.2 Harvest Replenishment Areas (Marine Protected Areas) Alternative
Areas declared harvest replenishment areas would prohibit the taking of market squid. Squid fishing activities would still occur in other areas. It is not possible to estimate the total amount of market squid consumed by seabirds in California waters. However, the creation of harvest replenishment areas should create seabird forage reserves and increase the amount of market squid available as prey to seabirds foraging in the those areas as compared to the current fishery (status quo). In addition, any possible seabird interactions with the fishery would not occur in these closed areas. But, exclusion of squid fishing in closed areas could shift fishing effort to areas with higher seabird populations (e.g., adjacent to seabird colonies, foraging areas, roosting areas), which could result in a higher rate of squid fishery interaction with seabirds. This scenario can be avoided by ensuring that closed areas encompass important seabird foraging, roosting, and breeding areas.

7.2.3.1.3.14.3 Options for area and time closure to address seabird issue

Option R.1:
Option R.1 would establish area and time closures around San Miguel, Anacapa, and Santa Barbara islands from February through October of each year, from one nautical mile from the high water mark. Seabirds that forage in the waters

and/or breed on these islands (see Table 7-8 would benefit because there would be decreased disturbance and interactions from squid vessels. Santa Barbara Island, and Prince Island and Castle Rock (both off San Miguel Island) are considered the most important seabird nesting areas in the Southern California Bight in terms of numbers of species and numbers of breeding birds. In addition, Anacapa Island supports the largest breeding colony of California brown pelicans in the United States.

Thus, these area and time closures would include protection of breeding habitat for the listed California brown pelican and several SSCs (Xantus's murrelet, ashy storm-petrel, black storm-petrel, rhinoceros auklet, tufted puffin, and double-crested cormorant). These three islands provide nesting habitat for all of the breeding California brown pelicans (Anacapa and Santa Barbara Islands) in the United States, about 81% of the Channel Island population and about 27% of the world's population of Xantus's murrelet, about 79% of the Channel Island population and about 32% of the world's population of ashy storm-petrel, all of the breeding black storm-petrels (Santa Barbara Island) in the United States, and the only colonies of tufted puffin (San Miguel) and rhinoceros auklet (San Miguel) in the Channel Islands (as well as habitat for other species listed in Table 7-11. The time closure from February through October would incorporate the breeding season for all seabird nesting species, during most years, and incorporates the protracted breeding season for brown pelicans. The majority of the Channel Islands seabirds nest between March and August. Ashy storm-petrel nesting is protracted (starts in April) and the majority of chicks fledge in September and October. In some cases, brown pelicans and pelagic cormorants start nesting in January, and Xantus's murrelets man visit breeding sites starting in January.

Area closures out to one mile from February through October would eliminate colony disturbances from the squid fishery at Anacapa, Santa Barbara, and San Miguel Islands due to close vessel approach. The one-mile distance should also significantly reduce any potential impacts to these sensitive species from light pollution associated with the squid fishery and would reduce the cumulative impact of multiple light boats close to the islands.

However, under this option not all seabird colonies in the Channel Islands will receive protection. Santa Cruz Island provides important habitat for ashy storm-petrels and Xantus's murrelets (and other species) and small numbers of both of these species have been found breeding on Santa Catalina and San Clemente islands. Closures around Anacapa, Santa Barbara, and San Miguel islands could result in increased fishing pressure around Santa Cruz Island and could negatively impact seabird species on this island. But, since the market squid fishing season typically occurs during the winter months, impacts to these other islands would only occur if fishing extended into the breeding season and squid were available in these areas.

In summary, this option (R.1) would significantly reduce the impacts of light use associated with the squid fishery from the status quo (Option R.5) and to a higher level than Options R.2, R.3 and R.4. If this option is chosen, we do recommend monitoring of the squid fishery to determine where the fishery is concentrated after implementation.

Option R.2:
Option R.2 would establish area and time closures around Anacapa and Santa Barbara Islands from March through August of each year, from one nautical mile from the mean high water mark. This area and time closure will serve primarily to protect nesting Brown Pelicans, an endangered and fully protected species, from disturbance, particularly light from the squid fishery. In addition, all seabirds that forage in the waters and/or breed on these islands (see Table 7-11) would benefit because there would be decreased disturbance and interactions from squid vessels. Santa Barbara Island is considered one of the most important seabird nesting areas in the Southern California Bight, in terms of numbers of species and numbers of breeding birds. Anacapa Island supports the largest breeding colony of California brown pelicans in the United States.

Thus, these area and time closures would include protection of breeding habitat for the listed California brown pelican and several SSCs (Xantus's murrelet, ashy storm-petrel, and black storm-petrel). Anacapa and Santa Barbara islands provide nesting habitat for all of the breeding California brown pelicans (Anacapa and Santa Barbara islands) in the United States, about 75% of the Channel Island population and about 25% of the world's population of Xantus's murrelet, about 33% of the Channel Island population and about 14% of the world's population of ashy storm-petrel, and all of the breeding black storm-petrels (Santa Barbara Island) in the United States (as well as habitat for other species listed in Table 7-12). The majority of the Channel Islands seabirds nest between March and August, thus the time closure from March through August would incorporate the entire breeding season for several nesting seabird species, during most years. California brown pelicans have a protracted breeding season which can start as early as January and end as late as October. Ashy storm-petrel nesting is protracted (starts in April) and the majority of chicks fledge in September and October. Xantus's murrelets many visit breeding sites starting in January. These species would thus be susceptible to inflight strikes and colony disturbances if the squid fishery occurs close to their breeding colonies during January, February, September, and October.

Area closures out to 1 mile from March through August would eliminate colony disturbances due to close squid fishery vessel approach for most of the seabirds that breed at Anacapa and Santa Barbara islands. The one-mile distance should also significantly reduce any potential impacts to these sensitive species from light pollution associated with the squid fishery and would reduce the cumulative impact of multiple light boats close to the islands. The reduction in impacts would not be as large as under Option R.1 (which has a longer closure period)

due to the presence of breeding seabirds in January, February, September, and October as mentioned in the previous paragraph.

Additionally, under this option not all seabird colonies in the Channel Islands will receive protection. Castle Rock and Prince Island off San Miguel Island are considered, along with Santa Barbara Island, to be the most important seabird nesting areas in the Southern California Bight, in terms of numbers of species and numbers of birds. The only nesting colonies in the Channel Islands of the SSC species rhinoceros auklet and tufted puffin are found on San Miguel Island. San Miguel and Santa Cruz islands provide important habitat for ashy storm-petrels (about 68% of the Channel Island population) and Xantus's murrelets (about 18% of the Channel Island population) and small numbers of both of these species have been found breeding on Santa Catalina and San Clemente islands. Squid fishing does currently occur off Santa Cruz Island but rarely occurs off San Miguel Island. Closures around Anacapa and Santa Barbara could result in increased fishing pressure around Santa Cruz Island and an extension of the fishery to San Miguel Island. This could result in negative impacts to seabird species on these islands, and the level of impact is potentially greater than under OptionR.1, due to the importance of San Miguel Island for breeding seabirds. But since the market squid fishing season typically occurs during the winter months, impacts to these other islands would only occur if fishing extended into the breeding season and squid were available in these areas.

In summary, this option (R.2) would significantly reduce the impacts of light use associated with the squid fishery from the status quo (Option R.5) and for seabirds that breed on Anacapa and Santa Barbara Islands, and to a higher level than Options R.3 and R.4, but not to the extent of Option R.1. We recommend monitoring of the squid fishery to determine where the fishery is concentrated after implementation of this option is recommended.

Table 7-12. Seabird species that breed (indicated by an X) on Anacapa, Santa Barbara, and San Miguel islands in the Channel Islands.

SPECIES	ANACAPA	SANTA BARBARA	SAN MIGUEL
Diurnal species			
Brown pelican*	X	X	roost
Double-crested cormorant**	X	X	X
Brandt's cormorant	X	X	X
Pelagic cormorant	X	X	X
Western gull	X	X	X
Pigeon guillemot	X	X	X
Tufted puffin**			X
Western snowy plover*,**			not since 1991
Black oystercatcher	X	X	X
Nocturnal species			
Ashy storm-petrel**	probable	X	X
Black storm-petrel**		X	X
Leach's storm-petrel		X	X
Xantus's murrelet**	X	X	X
Rhinoceros auklet**			X

Cassin's auklet	X	X	X

* Federally and State listed as endangered
** State Species of Special Concern

Option R.3:
This option would establish area and time closures for squid fishing using attracting lights around San Miguel, Anacapa, and Santa Barbara islands from February through October from one nautical mile from the mean high water mark for these islands. Seabirds that forage in the waters and/or breed on these islands (see Table 7-12) would benefit because there would be decreased disturbance and interactions from lights associated with squid vessels. Santa Barbara Island, and Prince Island and Castle Rock (both off San Miguel Island) are considered the most important seabird nesting areas in the Southern California Bight, in terms of numbers of species and numbers of breeding birds. In addition, Anacapa Island supports the largest breeding colony of California brown pelicans in the United States.

Thus, these area and time closures would significantly reduce any potential impact of light pollution near breeding habitat for the listed California brown pelican and several SSCs (Xantus's murrelet, ashy storm-petrel, black storm-petrel, rhinoceros auklet, tufted puffin, and double-crested cormorant). These three islands provide nesting habitat for all of the breeding California brown pelicans (Anacapa and Santa Barbara islands) in the United States, about 81% of the Channel Island population and about 27% of the world's population of Xantus's murrelet, about 79% of the Channel Island population and about 32% of the world's population of ashy storm-petrel, all of the breeding black storm-petrels (Santa Barbara Island) in the United States, and the only colonies of tufted puffin (San Miguel) and rhinoceros auklet (San Miguel) in the Channel Islands (as well as habitat for other species listed in Table 7-12). The time closure from February through October would incorporate the breeding season for all nesting seabird species, during most years, and incorporates the protracted breeding season for brown pelicans. The majority of the Channel Islands seabirds nest between March and August. Ashy storm-petrel nesting is protracted (starts in April) and the majority of chicks fledge in September and October. In some cases, brown pelicans and pelagic cormorants start nesting in January and Xantus's murrelets many visit breeding sites starting in January.

However, under this option noise associated with squid fishing activities (e.g., engine noise, generators, radios, human voices) still has the potential to cause disturbances to breeding seabirds which require nesting and roosting sites free from human disturbance. At this time, there is no control over the number of squid vessels in any particular area. Personnel from the Channel Islands National Park Service have reported squid boats fishing as close as 75 to 450 feet (< 1/8 mile) from Anacapa Island, and as many as 12 boats at one time. Brown pelicans, cormorants, alcids, and other seabirds, are affected by ancillary fishing activities (e.g., vessel proximity, motor noise, generators, radios, etc.) near roosting and breeding sites. Research has shown that many seabird

species are disturbed by events that are out of the ordinary (Manuwal 1978; Anderson and Keith 1980; Carney and Sydeman 1999). This includes not only direct human disturbance, but also loud noises. Disturbances (including close vessel approach) at brown pelican, double-crested and Brandt's cormorant, and common murre colonies are known to cause nest abandonment and increased egg predation (Ellison and Cleary 1978; Anderson and Keith 1980; Anderson 1988; Parker et al. 2000; Rojek and Parker 2000; Parker et al. 2001). The low productivity of California brown pelicans on Anacapa Island in 1999 has been attributed to both the noise and associated lights of squid vessels close to the island.

In addition, some level of artificial lighting will be necessary for squid vessels to conduct their operations safely, even without light boats. We cannot rule out the possibility that this artificial night lighting associated with the squid purse seine fishery will result in disorientation of these species and collisions with vessels. With no control over the number of vessels in an area, it is possible that multiple boats with operating lights could be close to seabird colonies during sensitive periods in their nesting season. For example, small amounts of light on vessels in the Channel Islands have been observed to cause disorientation in Xantus's murrelets and their chicks when they depart the colony.

In addition, under this option not all seabird colonies in the Channel Islands will receive protection. Santa Cruz Island provides important habitat for ashy storm-petrels and Xantus's murrelets (and other species) and small numbers of both of these species have been found breeding on Santa Catalina and San Clemente islands. Closures to light use around Anacapa, Santa Barbara, and San Miguel islands could result in increased night-fishing pressure around Santa Cruz Island and could negatively impact nocturnally nesting seabird species on this island. But since the market squid fishing season typically occurs during the winter months, impacts to these other islands would only occur if fishing extended into the breeding season and squid were available in these areas.

In summary, this option would reduce the impacts of light use associated with the squid fishery from the Status quo (Option R.5) and to a higher level than Option R.4, but not to the extent of Options R.1, R.2, R.3, or R.4. If this option is chosen, we recommend monitoring of the squid fishery to determine where the fishery is concentrated after implementation. We also recommend monitoring of the squid fishing to determine if noise and other activities associated with the squid fishery is impacting seabird colonies in the Channel Islands and to determine if the area and time closures to use of attracting lights in the squid fishery is enforceable.

Option R.4:
This option would establish area and time closure areas for squid fishing lights using attracting lights around Anacapa and Santa Barbara islands from March through August from one nautical mile from the mean high water mark for these

islands. This area and time closure will serve primarily to protect nesting brown pelicans, an endangered and fully protected species, from light disturbance associated with the squid fishery during the height of their breeding season. In addition, all seabirds that forage in the waters and/or breed on these islands (see Table 7-12) would benefit because there would be decreased disturbance and interactions from lights associated with the squid vessels. Santa Barbara Island is considered one of the most important seabird nesting areas in the Southern California Bight, in terms of numbers of species and numbers of breeding birds. Anacapa Island supports the largest breeding colony of California brown pelicans in the United States.

Thus, these area and time closures would significantly reduce any potential impact of light pollution near breeding habitat for the listed California brown pelican and several SSCs (Xantus's murrelet, ashy storm-petrel, and black storm-petrel). Anacapa and Santa Barbara islands provide nesting habitat for all of the breeding California brown pelicans (Anacapa and Santa Barbara Islands) in the United States, about 75% of the Channel Island population and about 2% of the world's population of Xantus's murrelet, about 33% of the Channel Island population and about 14% of the world's population of ashy storm-petrel, and all of the breeding black storm-petrels (Santa Barbara Island) in the United States (as well as habitat for other species listed in Table 7-12). The majority of the Channel Islands seabirds nest between March and August, thus the time closure from March through August would incorporate the entire breeding season for several nesting seabird species, during most years. California brown pelicans have a protracted breeding season which can start as early as January and end as late as October. Ashy storm-petrel nesting is protracted (starts in April) and the majority of chicks fledge in September and October. Xantus's murrelets many visit breeding sites starting in January.

The reduction in impacts from artificial lighting, therefore, would not be as large as under Option R.3 (which has a longer closure period). Breeding seabirds would thus be susceptible to inflight strikes and colony disturbances if attracting lights are used in the squid fishery close to seabird breeding colonies during January, February, September, and October.

Under this option, noise associated with squid fishing activities (e.g., engine noise, generators, radios, human voices) still has the potential to cause disturbances to breeding seabirds which require nesting and roosting sites free from human disturbance. At this time, there is no control over the number of squid vessels in any particular area. Personnel from the Channel Islands National Park Service have reported squid boats fishing as close as 75 to 450 feet (< 1/8 mile) from Anacapa Island, and as many as 12 boats at one time. Brown pelicans, cormorants, alcids, and other seabirds, are affected by ancillary fishing activities (e.g., vessel proximity, motor noise, generators, radios, etc.) near roosting and breeding sites. Research has shown that many seabird species are disturbed by events which are out of the ordinary (Manuwal 1978;

Anderson and Keith 1980; Carney and Sydeman 1999). This includes not only direct human disturbance, but also loud noises. Disturbances (including close vessel approach) at brown pelican, double-crested and Brandt's cormorant, and common murre colonies are known to cause nest abandonment and increased egg predation (Ellison and Cleary 1978; Anderson and Keith 1980; Anderson 1988; Parker et al. 2000; Rojek and Parker 2000; Parker et al. 2001). The low productivity of California brown pelicans on Anacapa Island in 1999 has been attributed to both the noise and associated lights of squid vessels close to the island.

In addition, some level of artificial lighting will be necessary for squid vessels to conduct their operations safely, even without light boats. We cannot rule out the possibility that this artificial night lighting associated with the squid purse seine fishery will result in disorientation of these species and collisions with vessels. With no control over the number of vessels in an area, it is possible that multiple boats with operating lights could be close to seabird colonies during sensitive periods in their nesting season. For example, small amounts of light on vessels in the Channel Islands have been observed to cause disorientation in Xantus's murrelets and their chicks when they depart the colony.

Additionally, under this option not all seabird colonies in the Channel Islands will receive protection. Castle Rock and Prince Island off San Miguel Island are considered, along with Santa Barbara Island, to be the most important seabird nesting areas in the Southern California Bight, in terms of numbers of species and numbers of birds. The only nesting colonies in the Channel Islands of the SSC species rhinoceros auklet and tufted puffin are found on San Miguel Island. San Miguel and Santa Cruz islands provide important habitat for ashy storm-petrels (about 68% of the Channel Island population) and Xantus's murrelets (about 18% of the Channel Island population) and small numbers of both of these species have been found breeding on Santa Catalina and San Clemente islands. Squid fishing does currently occur off Santa Cruz Island but rarely occurs off San Miguel Island. Closures to light use around Anacapa and Santa Barbara could result in increased night-fishing pressure around Santa Cruz Island and an extension of the fishery to San Miguel Island. This could result in negative impacts to seabird species on these islands, and the level of impact is potentially greater than under Options R.1 and R.3, due to the importance of San Miguel Island for breeding seabirds. But since the market squid fishing season typically occurs during the winter months, impacts to these other islands would only occur if fishing extended into the breeding season and squid were available in these areas.

In summary, this option would reduce the impacts of light use associated with the squid fishery from the status quo (Option R.5), but not to the extent of Options R.1, R.2, R.3 or R.4. If this option is chosen, we recommend monitoring of the squid fishery to determine where the fishery is concentrated after implementation. We also recommend monitoring of the squid fishing to

determine if noise and other activities associated with the squid fishery is impacting seabird colonies in the Channel Islands and to determine if the area and time closures to use of attracting lights in the squid fishery is enforceable.

Option R.5 (status quo)
This option would maintain the current interim regulation for lower wattage and shields on market squid light boats. The analysis is the same as stated in the section on environmental consequences of the "No Project or Status Quo" (Current Regulations) action in section 7.2.3.1.3.12.1.

In summary, this option would maintain current levels of potential impacts to seabirds breeding in the Channel Islands if the market squid fishery occurs close to breeding colonies during the breeding season. Potentially significant impacts to seabird species in decline in the Channel Islands are greater than all of the other possible options, R.1, R.2, R.3, and R.4. If this option is chosen, we recommend monitoring of the squid fishery and studies to assess impacts to seabirds from the market squid fishery and to further assess the effectiveness of lower wattage and shielding in reducing illumination levels on colonies. In addition, enforcement of the lower wattage and shielding needs to be evaluated.

7.2.3.1.3.14.4 Weekend Closures

Option C.1 to continue closures from noon Friday to noon Sunday from the U.S.-Mexico border to the California-Oregon border would provide a two-day and two-night respite weekly to the nesting seabirds at the Islands during the fishing season. Weekend closures theoretically reduce squid fishery interactions with seabirds by 29% (2/7's) which should be beneficial to the seabird colonies. The option to discontinue weekend closures has the potential to increase squid fishery interactions with seabirds by 40%. Please see the discussion above regarding the possible interactions between the squid fishery and seabirds.

7.2.3.1.3.14.5 Catch Limitation Option

Maintaining the status quo of 125,000 tons is not likely to increase the total fishing effort beyond that in the "No Project" Alternative, whereas a no seasonal landing limit could result in increased fishing effort which could increase the potential for seabird interactions. Reducing landings during an El Niño year is likely to decrease fishing effort and lower potential for seabird interactions. Additionally, during El Niño years the availability and abundance of squid are typically less than in non-El Niño years, thus, lowered landings would benefit those seabirds that consume squid as more squid would be available for their consumption.

7.2.3.1.3.14.6 Commercial Gear Restrictions Option

Maintaining existing gear restrictions (Option Q.1) is not likely to increase squid fishery-seabird interaction rates. If area and time closures are selected as part of the squid fishery management plan (Options R.1, R.2, R.3 or R.4), not all seabird nesting sites are protected and continuing shielding and wattage restrictions would reduce light pollution to the rookeries as well as reduce squid fishery interactions with seabirds.

Removing existing gear restrictions (Option Q.2) that limit wattage is 30,000 watts or less and require lights to be shielded are likely to have a significant negative impact on seabird rookeries (see section 7.2.3.1.3.14.3 for discussion). If area and time closures are put in place for the squid fishery, not all seabird nesting sites are protected; discontinuing the gear restrictions are likely to increase squid fishery interactions with seabirds.

7.2.3.1.3.14.7 Other Management Options

There are other management options including, fee structure, monitoring program, vessel identification, regulation of bycatch, prohibited species, size limits, and coordination with the Federal CPS Plan, under consideration in the MSFMP. Implementation of these options does not directly affect or influence squid fishery interactions with seabirds, thus, they are not addressed.

7.2.3.1.4 Marine Mammals

7.2.3.1.4.1 ESA and MMPA Considerations

All marine mammals are protected under the Federal Marine Mammal Protection Act (MMPA 1972, amended 1994) administered by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS). Additionally, NMFS and the USFWS grants at-risk marine mammal stocks additional protection under the Federal Endangered Species Act (FESA) with endangered, threatened, and depleted status designations. NMFS is charged with the implementation of the FESA for marine and anadromous species while the USFWS implements programs and regulations for terrestrial and freshwater species. The FESA requires NMFS and the USFWS to develop recovery plans for species added to the list of threatened and endangered (T&E) Species. The plans describe necessary conservation measures to ensure recovery of the species so that it becomes appropriate to remove the species from the T&E list. The State also designates protection to one marine mammal (sea otter) under the California Endangered Species Act (CESA). Additionally, the California Fish and Game Code (§4700) designates several marine mammal species as "fully protected."

Under FESA, an endangered species is defined in the law as "any species which is in danger of extinction throughout all or a significant portion of its range." Six whale species occurring in California waters are listed as endangered. A

threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Steller sea lion (eastern stock), Guadalupe fur seal and the southern sea otter are the only marine mammal species occurring in California waters that are listed as threatened. A candidate species is "any species being considered by the Secretary for listing as an endangered or threatened species, but not yet the subject of a proposed rule." There are no candidate marine mammal species found in California waters. The Guadalupe fur seal is listed under CESA as threatened.

The MMPA also provides designations for at-risk marine mammal stocks. A species or a stock of a species is designated as depleted when it falls below its optimum sustainable population (OSP), or if the species is listed under FESA. Thus, six whale species and the southern sea otter are considered depleted. The MMPA also lists a stock as strategic if: (1) it is listed as a T&E species under FESA, (2) the stock is declining and likely to be listed as threatened under the FESA, (3) the stock is listed as depleted under the MMPA, or (4) the stock has direct human-caused mortality which exceeds that stock's potential biological removals (PBR) level. The term PBR is defined as "the maximum number of animals, not including natural mortalities that may be removed from a marine mammal stock while allowing that stock to reach or maintain its OSP" (Barlow et al. 1995). As mandated in the 1994 amendments to the MMPA, NMFS develops estimates of PBRs for each marine mammal stock in U.S. waters.

NMFS issues permits through the Marine Mammal Authorization Program (MMAP) to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA. The owner of a vessel or non-vessel gear participating in a Category I or II fishery must obtain authorization from NMFS in order to lawfully, incidentally take a marine mammal in a commercial fishery, while those participating in Category III fisheries may incidentally take marine mammals without registering for or receiving an authorization (NMFS/NOAA/OPR 2001). NMFS may also issue permits for the incidental, but not intentional, taking of marine mammals listed as T&E under FESA, (those species under NMFS' jurisdiction), if NMFS determines that either 1) incidental mortality and serious injury due to commercial fishing will have a negligible impact on the affected species or stock, 2) a recovery plan has been or is being developed, 3) a monitoring program has been established (where required), or 4) vessels are registered, and a take reduction plan has been developed or is being developed (NMFS/NOAA/OPR 2001).

With the 1994 amendments to the MMPA, intentional takes of marine mammals are now illegal except when imminently necessary in self-defense or to save the life of another person.

7.2.3.1.4.2 Current Fishery Categories

Under section 118 of the MMPA, NMFS classifies all U.S. commercial fisheries into one of three categories (I, II, III) based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery (NMFS/NOAA website). The categorization of a fishery determines whether fishery participants will be required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. Fisheries are listed as Category I if the annual mortality and serious injury of a marine mammal stock in a given fishery is greater than or equal to 50 percent of the PBR. Fisheries are listed as Category II if the annual mortality and serious injury of a marine mammal stock is greater than 1 percent and less than 50 percent of the PBR level, while Category III's annual mortality and serious injury of a marine mammal stock in a given fishery is less than or equal to 1 percent of the PBR level. Only participants in Category I or II are required to be registered under the MMPA (NMFS/NOAA website).

In California, the offshore shark-swordfish drift gill net and the large mesh (>3.5 inches) set gill net fishery are classified as Category I fisheries, while the anchovy, mackerel and tuna purse seine, the squid purse seine, and the California longline are classified as Category II fisheries. Class III fisheries include: small mesh (<3.5 inches) set gill net; sardine purse seine; herring purse seine; squid dip net (brail); salmon troll; groundfish longline/set line; shark/bonito longline/set line; groundfish trawl; shrimp trawl, lobster, prawn, shrimp, rock crab and fish pot; crab pot; sablefish pot; shrimp pot and trap; swordfish harpoon; bait pens; abalone, urchin; kelp; sea urchin, clam, octopus, oyster, sea cucumber, scallop, ghost shrimp hand dive or mechanical collection; CPFV; and finfish and shellfish live-trap/hook and line (NMFS/NOAA 2001). Category III fisheries have a remote likelihood of marine mammal interaction or no known serious injuries or mortalities with marine mammals. There is no category classification for recreational angling.

7.2.3.1.4.3 Marine Mammals in California Waters

The coast of California supports a rich assemblage of marine mammals with 23 species from the order Cetacea, six species from the suborder Pinnipedia and one species from the order Carnivora. Table 7-13 lists these marine mammal species and their current listing/designation status and PBR (from Forney et al. 2000) level (note the "stock" designations for harbor porpoise, bottlenose dolphin, Steller sea lion and northern fur seal). Following are brief descriptions of cetacean T&E species and cetacean species with documented fishery interactions. Pinnipeds and sea otters are discussed due to their abundance, distribution, behavior, and/or potential to interact with numerous fisheries.

Table 7-13. Marine mammal species found in California waters.

Species	Status	PBR
HUMPBACK WHALE *(Megaptera novaeangliae*)	FE, SS, DEP	1.7

Table 7-13. Marine mammal species found in California waters.

Species	Status	PBR
NORTHERN RIGHT WHALE *(Eubalaena glacialis)*	FE, SS, DEP	N/D
SPERM WHALE *(Physeter macrocephalus)*	FE, SS, DEP	2.0
SEI WHALE *(Balaenoptera borealis)*	FE, SS, DEP	N/D
FIN WHALE *(Balaenoptera physalus)*	FE, SS, DEP	2.1
BLUE WHALE *(Balaenoptera musculus)*	FE, SS, DEP	1.7
GRAY WHALE *(Eschrichtius robustus)*		575
HARBOR PORPOISE *(Phocoena phocoena)*(Central CA Stock)	SS	42
BRYDE'S WHALE (*Balaenoptera edeni*)		N/D
MINKE WHALE *(Balaenoptera acutorostrata)*		4.0
KILLER WHALE *(Orcinus orca)*		2.1
PYGMY SPERM WHALE *(Kogia breviceps)*		28
CUVIER'S BEAKED WHALE *(Ziphius cavirostris)*		43
BAIRD'S BEAKED WHALE *(Berardius bairii)*		2.0
SHORT-FINNED PILOT WHALE *(Globicephala macrorhynchus)*		5.7
NORTHERN RIGHT WHALE DOLPHIN *(Lissodelphis borealis)*		97
LONG-BEAKED COMMON DOLPHIN *(Delphinus capensis)*		14
SHORT-BEAKED COMMON DOLPHIN *(Delphinus delphis)*		79
BOTTLENOSE DOLPHIN *(Tursiops truncatus)* (Offshore Stock)		8.5
STRIPED DOLPHIN *(Stenella coeruleoalba)*		180
PACIFIC WHITE-SIDED DOLPHIN *(Lagenorhynchus obliquidens)*		157
RISSO'S DOLPHIN *(Grampus griseus)*		105
DALL'S PORPOISE *(Phocoenoides dalli)*		737
STELLER SEA LION *(Eumetopias jubatus)* (Eastern Stock)	FT, SS, DEP	1,368
NORTHERN FUR SEAL *(Callorhinus ursinus)* (San Miguel Stock)		100
GUADALUPE FUR SEAL *(Arctocephalus townsendi)*	FT, ST, SS, PRO	104
NORTHERN ELEPHANT SEAL *(Mirounga angustirostris)*	PRO	2,142
PACIFIC HARBOR SEAL *(Phoca vitulina richardsi)* (CA stock)		1,678
CALIFORNIA SEA LION *(Zalophus californianus californianus)*		6,591
SOUTHERN SEA OTTER *(Enhydra lutris nereis)*	FT, DEP, PRO	N/G